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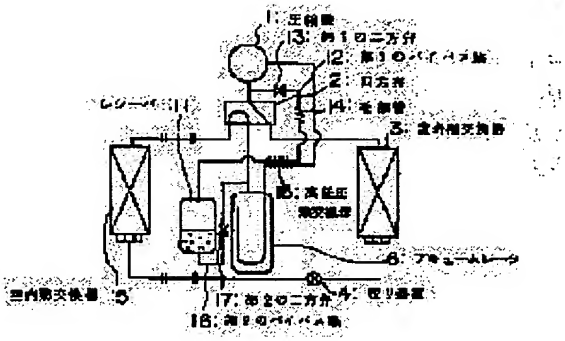
(54) REFRIGERATION CYCLE

(57)Abstract:
PROBLEM TO BE SOLVED: To provide a refrigeration cycle capable of restricting a variation of a composition of a circulating refrigerant due to a surplus refrigerant and improving COP even in the case a non-azeotroic refrigerant is used.
SOLUTION: A first two-way valve 13 and a capillary tube 14 for adjusting a refrigerant flow rate are provided, a piping for connecting a compressor 1 to a four-way valve 2 and a first bypass 12 for connecting a receiver 11, a high-low pressure heat exchanger 15 for exchanging heat between a non- azeotropic refrigerant at low pressure from an accumulator 6 to be sucked into a compressor 1 and said refrigerant at high temperature and high pressure passing inside the first bypass 12, and a second two-way valve 17 are provided, and a second bypass 16 for connecting the receiver 11 and the accumulator 6 is provided.



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* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1] The refrigerating cycle characterized by providing the following. The compressor which forms into elevated-temperature high pressure the non-azeotropy mixing refrigerant which consists of two or more kinds of refrigerants with which the boiling points differ, and is made to circulate through it through a four way valve, a condenser, an collimator, an evaporator, and an accumulator in order Receiver The 1st bypass way which connects piping which the capillary tube which adjusts the 1st two way valve and refrigerant flow rate is prepared, and connects said compressor and four way valve, and said receiver The 2nd bypass way which the heat exchanger which carries out heat exchange, and the 2nd two way valve are prepared in said low-pressure refrigerant of the accumulator inhaled by said compressor, and said refrigerant of the elevated-temperature high pressure passing through the inside of said 1st bypass way, and connects said receiver and accumulator
[Claim 2] Said receiver is a refrigerating cycle according to claim 1 characterized by extending caudad as a dashboard and forming the pars basilaris ossis occipitalis of said accumulator.
[Claim 3] The 1st temperature sensor installed in the discharge side of said compressor, and the 2nd temperature sensor installed in said condenser, The difference of the detection temperature of said 1st temperature sensor and the detection temperature of said 2nd temperature sensor is calculated. And compare the value with the 1st allowed value set up beforehand, and when said value is below a lower limit of the 1st allowed value, said 1st two way valve is changed into an open condition. It is a refrigerating cycle given in claim 1 characterized by having the 1st valve-control means which changes said 2nd two way valve into an open condition when said value exceeds the upper limit of the 1st allowed value, or either of 2.
[Claim 4] The 3rd temperature sensor installed in the inlet side of said compressor, and the 4th temperature sensor installed in said evaporator, The difference of the detection temperature of said 3rd temperature sensor and the detection temperature of said 4th temperature sensor is calculated. And compare the value with the 2nd allowed value set up beforehand, and when said value is below a lower limit of the 2nd allowed value, said 1st two way valve is changed into an open condition. It is a refrigerating cycle given in claim 1 characterized by having the 2nd valve-control means which changes said 2nd two way valve into an open condition when said value exceeds the upper limit of the 2nd allowed value, or either of 2.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to refrigerating cycles, such as an air conditioner which enclosed the non-azeotropy mixing refrigerant which consists of two or more kinds of refrigerants with which the boiling points differ.
[0002]
[Description of the Prior Art] Drawing 8 is the block diagram showing the refrigerating cycle of the conventional air conditioner, and the compressor which 1 inhales and compresses the gas refrigerant of low-temperature low voltage in an accumulator 6, and is used as the gas refrigerant of elevated-temperature high pressure, the outdoor heat exchanger to which a four way valve and 3 operate as a condenser in 2, and 4 are an collimator and indoor heat exchanger to which 5 operates as an evaporator in drawing.
[0003] In air conditioning operation, in the refrigerating cycle of the conventional air conditioner constituted as mentioned above, the gas refrigerant of elevated-temperature high pressure goes into an outdoor heat exchanger 3 through discharge and a four way valve 2 from a compressor 1, for example. Heat exchange of this gas refrigerant is carried out to the open air by the outdoor heat exchanger, it turns into a liquefied refrigerant, and goes into an collimator 4. The liquefied refrigerant is decompressed by the collimator 4, turns into a low two phase refrigerant of a dryness fraction, and is sent into indoor heat exchanger 5. And heat exchange is carried out to air indoor by indoor heat exchanger 5, and it evaporates, it becomes the high two phase refrigerant of a dryness fraction, and is again inhaled by the compressor 1 via a four way valve 2 and an accumulator 6. At this time, the surplus refrigerant which remained in the refrigerant circuit is stored by the accumulator 6.
[0004]
[Problem(s) to be Solved by the Invention] It sets to the above conventional refrigerating cycles. R(chlorofluocarbon)134a 52 % of the weight, Since it is easy to gasify many R32 and R125 which are a low-boiling point refrigerant in the surplus refrigerant stored by the accumulator 6 when the non-azeotropy mixing refrigerant which mixed R125 25% of the weight, and mixed R32 by 23% of the weight of the ratio is used, When the amount of the surplus refrigerant which the refrigerant which circulates through the inside of a refrigerating cycle serves as a presentation of there being more R32 and R125 which are a low-boiling point refrigerant, and is stored by the accumulator 6 changes The presentation of the refrigerant which circulates through the inside of a refrigerating cycle also changed, the physical properties of a circulation refrigerant were changed from this, and fluctuation of working pressure or capacity etc. had arisen.
[0005] Moreover, it is known that the heat transfer rate in heat exchanger piping will become small by the non-azeotropy nature of a mixed refrigerant compared with the single refrigerant of R22 grade used from the former, and the technical problem that COP (effectiveness) of a refrigerating cycle fell by this also occurred.
[0006] Even if this invention was made in order to solve this technical problem, and a non-azeotropy mixing refrigerant is used for it, it aims at offering the refrigerating cycle which can control fluctuation of a presentation of the circulation refrigerant by the surplus refrigerant, and

raises COP.
[0007]
[Means for Solving the Problem] The compressor which the refrigerating cycle concerning this invention forms into elevated-temperature high pressure the non-azeotropy mixing refrigerant which consists of two or more kinds of refrigerants with which the boiling points differ, and is circulated through a four way valve, a condenser, an collimator, an evaporator, and an accumulator in order, The 1st bypass way which connects a receiver, and piping which the capillary tube which adjusts the 1st two way valve and refrigerant flow rate is prepared, and connects said compressor and four way valve and said receiver, The heat exchanger which carries out heat exchange, and the 2nd two way valve are prepared in said low-pressure refrigerant of the accumulator inhaled by said compressor, and said refrigerant of the elevated-temperature high pressure passing through the inside of said 1st bypass way, and it has the 2nd bypass way which connects said receiver and accumulator.
[0008] Said receiver is caudad prolonged as a dashboard and the pars basilaris ossis occipitalis of said accumulator is formed.
[0009] Moreover, the 1st temperature sensor installed in the discharge side of said compressor and the 2nd temperature sensor installed in said condenser, The difference of the detection temperature of said 1st temperature sensor and the detection temperature of said 2nd temperature sensor is calculated. And the value is compared with the 1st allowed value set up beforehand, when said value is below a lower limit of the 1st allowed value, said 1st two way valve is changed into an open condition, and when said value exceeds the upper limit of the 1st allowed value, it has the 1st valve-control means which changes said 2nd two way valve into an open condition.
[0010] Furthermore, the 3rd temperature sensor installed in the inlet side of said compressor and the 4th temperature sensor installed in said evaporator, The difference of the detection temperature of said 3rd temperature sensor and the detection temperature of said 4th temperature sensor is calculated. And the value is compared with the 2nd allowed value set up beforehand, when said value is below a lower limit of the 2nd allowed value, said 1st two way valve is changed into an open condition, and when said value exceeds the upper limit of the 2nd allowed value, it has the 2nd valve-control means which changes said 2nd two way valve into an open condition.
[0011]
[Embodiment of the Invention] Operation gestalt 1. drawing 1 is the block diagram concerning the operation gestalt 1 of this invention showing the refrigerating cycle of an air conditioner, for example, and shows the condition at the time of air conditioning operation. In addition, the sign same identically to the former explained by drawing 8 as a considerable part is attached, and explanation is omitted.
[0012] The 1st bypass way which branched in drawing from piping whose 12 11 connects a receiver and connects a compressor 1 and a four way valve 2, and was connected to the receiver 11, The 1st two way valve to which 13 opens and closes the 1st bypass way 12, the capillary tube which adjusts the amount of the gas refrigerant of elevated-temperature high pressure with which 14 flows on the 1st bypass way 12, The high low voltage heat exchanger which carries out heat exchange for the gas refrigerant of low-temperature low voltage with which 15 is inhaled by the compressor 1, and the gas refrigerant passing through the inside of the 1st bypass way 12 of elevated-temperature high pressure, The 2nd bypass way which 16 branched from inlet-port piping of an accumulator 6, and was connected to a receiver's 11 pars basilaris ossis occipitalis, and 17 are the 2nd two way valve which opens and closes the 2nd bypass way 16. In addition, the refrigerant used for this operation gestalt is a non-azeotropy mixing refrigerant which consists of two or more kinds of refrigerants with which the boiling points differ.
[0013] In the refrigerating cycle constituted as mentioned above, the actuation at the time of air conditioning operation is explained. In addition, the 1st two way valve shall be in an open condition at the time of a start up. The gas refrigerant of elevated-temperature high pressure goes into an outdoor heat exchanger 3 through discharge and a four way valve 2 from a

compressor 1. Heat exchange of this gas refrigerant is carried out to the open air by the outdoor heat exchanger 3, it turns into a liquefied refrigerant, and goes into an collimator 4. The liquefied refrigerant is decompressed by the collimator 4, turns into a two phase refrigerant of low-temperature low voltage of dryness fractions 0.2-0.3, and is sent into indoor heat exchanger 5. And heat exchange is carried out to air indoor by indoor heat exchanger 5, and it evaporates, it becomes the two phase refrigerant of low-temperature low voltage of dryness fractions 0.9-1.0, and is again inhaled by the compressor 1 via a four way valve 2 and an accumulator 6.

[0014] On the other hand, it flows to the direction of the 1st bypass way 12 with open [of the 1st two way valve 13], and passes along a capillary tube 14, and heat exchange is further carried out to the gas refrigerant of low-temperature low voltage inhaled by the compressor 1 with a passage in the high low voltage heat exchanger 15, namely, it is cooled, and some gas refrigerants of elevated-temperature high pressure breathed out from the compressor 1 turn into a high-pressure liquid cryogen, and it is stored by the receiver 11 as a surplus refrigerant.

[0015] Here, presentation change of a surplus refrigerant is explained based on drawing 2 . Drawing 2 is the comparison Fig. of presentation change of the circulation refrigerant when storing a non-azeotropy mixing refrigerant in a receiver and an accumulator. When an excessive non-azeotropy mixing refrigerant is accumulated in the accumulator 6 of a refrigerating cycle like before shown in drawing 8 , since the mixed refrigerant is low voltage, presentation change becomes large (refer to I). On the other hand, since the hot surplus mixing refrigerant (liquefied) is stored in a receiver 11 in the case of this operation gestalt, presentation change of the mixed refrigerant which circulates through a refrigerating cycle becomes small (refer to RO).

[0016] In addition, when operational status changes with change of an OAT, an air-conditioning load, etc. and it becomes insufficient [a refrigerant] during steady operation, the 2nd two way valve 17 is changed into an open condition, and the surplus refrigerant stored in the receiver 11 is supplied to an accumulator 6.

[0017] Since it is made to go via the 1st bypass way 12, it cools and some gas refrigerants of elevated-temperature high pressure, i.e., a surplus refrigerant, breathed out from the compressor 1 were stored in the receiver 11 according to the operation gestalt 1 as mentioned above, it can become possible to lose the surplus refrigerant in an accumulator 6, presentation change of the refrigerant which circulates through a refrigerating cycle can also be suppressed small, and fluctuation of working pressure or capacity etc. can be prevented.

[0018] Moreover, since the refrigerant inhaled by the compressor 1 by losing the surplus refrigerant in an accumulator 6 is certainly gasifiable, the effectiveness of a compressor 1 becomes good and it is effective in COP of a refrigerating cycle improving.

[0019] Operation gestalt 2. drawing 3 is the block diagram concerning the operation gestalt 2 of this invention showing the refrigerating cycle of an air conditioner, for example, and shows the condition at the time of air conditioning operation. In addition, the sign same identically to the operation gestalt 1 explained by drawing 1 as a considerable part is attached, and explanation is omitted.

[0020] In the operation gestalt 2, in the pars basilaris ossis occipitalis of an accumulator 6, a receiver 11 is caudad prolonged as a dashboard 18, and is formed, and this dashboard 18 is for carrying out heat exchange of the gas refrigerant of elevated-temperature high pressure led to the receiver 11 to the gas refrigerant of low-temperature low voltage in an accumulator 6. An accumulator 6 and a receiver 11 are connected by the 2nd bypass way 16, and the receiver 11 is connected to piping which connects a four way valve 2 to a compressor 1 through the 1st bypass way 12. The 1st two way valve 13 and capillary tube 14 are prepared in this 1st bypass way 12, and the 2nd two way valve 17 is attached in the bypass way 16 the 2nd.

[0021] Next, the actuation at the time of air conditioning operation is explained. In addition, since it is the same as that of the operation gestalt 1 about circulation of the refrigerant in the operation gestalt 2, explanation of operation is omitted. If some gas refrigerants of elevated-temperature high pressure breathed out by open [of the 1st two way valve 13] from the compressor 1 are led to the 1st bypass way 12, it will go into a receiver 11 through a capillary tube 14. At this time, heat exchange of the gas refrigerant of elevated-temperature high pressure which entered in the receiver 11 is carried out to the gas refrigerant of low-

temperature low voltage in an accumulator 6 by the dashboard 18, it turns into a high-pressure liquid cryogen, and is stored as a surplus refrigerant.
[0022] In addition, when a refrigerating cycle becomes insufficient [a refrigerant] also in this operation gestalt, the 2nd two way valve 17 is changed into an open condition, and an accumulator 6 is supplemented with the surplus refrigerant stored in the receiver 11.
[0023] thus -- since the pars basilaris ossis occipitalis of an accumulator 6 was caudad extended as a dashboard 18 and the receiver 11 was formed, there is no high low voltage heat exchanger 15 -- ** -- it is effective in the ability to cool the gas refrigerant of elevated-temperature high pressure which goes via the 1st bypass way 12.
[0024] Operation gestalt 3. drawing 4 is the block diagram concerning the operation gestalt 3 of this invention showing the refrigerating cycle of an air conditioner, for example, and shows the condition at the time of air conditioning operation. In addition, the sign same identically to the operation gestalt 1 explained by drawing 1 as a considerable part is attached, and explanation is omitted.
[0025] It is the 2nd temperature sensor which detects the temperature Tc of the refrigerant which 21 is attached in piping which connects a compressor 1 and a four way valve 2 in drawing, and the center section of the outdoor heat exchanger 3 which operates as a condenser is equipped with the 1st temperature sensor which detects the temperature Td of the gas refrigerant of elevated-temperature high pressure breathed out from the compressor 1, and 22, and is cooled by the outdoor heat exchanger 3.
[0026] 31 for example, in case it is the control circuit which controls the compressor 1 grade of an air conditioner, and it has the 1st valve-control means of this invention, for example, the amount of the surplus refrigerant at the time of air conditioning operation is adjusted Subtract the detection temperature Tc of the 2nd temperature sensor 22 from the detection temperature Td of the 1st temperature sensor 21, and it asks for the regurgitation degree of superheat SHd. And the lower limit of the 1st allowed value of the degree of superheat SHd and the regurgitation degree of superheat set up beforehand is compared. When the regurgitation degree of superheat SHd is below the lower limit of the 1st allowed value, the 1st two way valve 13 is changed into an open condition through the valve drive circuit 32, and when the regurgitation degree of superheat SHd exceeds the lower limit of the 1st allowed value, the 1st two way valve 13 is made into a closed state.
[0027] Moreover, at the time of steady operation, said regurgitation degree of superheat SHd and upper limit of the 1st allowed value are compared, when the regurgitation degree of superheat SHd exceeds the upper limit of the 1st allowed value, the 2nd two way valve 17 is changed into an open condition through the valve drive circuit 32, and when the regurgitation degree of superheat SHd is below the upper limit of the 1st allowed value, the 2nd two way valve 17 is made into a closed state. In addition, the 1st and 2nd two way valves 13 and 17 mentioned above consist of a solenoid valve.
[0028] Next, actuation of the refrigerating cycle constituted as mentioned above is explained based on drawing 5 . Drawing 5 is a flow chart concerning the operation gestalt 3 which shows actuation of the refrigerating cycle of an air conditioner, for example. In addition, since it is the same as the operation gestalt 1 about actuation of each part when circulating the above-mentioned non-azeotropy mixing refrigerant, explanation is omitted.
[0029] If a compressor 1 is started, a control circuit 31 will change the 1st two way valve 13 into an open condition through the valve drive circuit 32, and will begin operation which stores a surplus refrigerant in a receiver 11. First, the temperature Tc of the two phase refrigerant in an outdoor heat exchanger 3 is inputted through the 2nd temperature sensor 22, and, subsequently the temperature Td of the gas refrigerant of elevated-temperature high pressure breathed out from the compressor 1 is inputted through the 1st temperature sensor 21. And the detection temperature Tc of the 2nd temperature sensor 22 is subtracted from the detection temperature Td, and it asks for the regurgitation degree of superheat SHd, and the lower limit of the degree of superheat SHd and the 1st allowed value of the regurgitation degree of superheat set up beforehand is compared.
[0030] Since the lower limit of the 1st allowed value is higher than the regurgitation degree of

superheat SHd, the open condition of the 1st two way valve 13 is held at the time of a start up, and it starts the input of the detection temperature Tc of the 2nd temperature sensor 22, and the detection temperature Td of the 1st temperature sensor 21 again. If the refrigerant in an accumulator 6 is lost, the intake air temperature of a compressor 1 rises and the regurgitation degree of superheat SHd based on the detection temperature Tc and the detection temperature Td exceeds the lower limit of the 1st allowed value while repeating this actuation and performing it, the 1st two way valve 13 will be made into a closed state through the valve drive circuit 32, and the reservoir of the surplus refrigerant to a receiver 11 will be ended.

[0031] During steady operation, said regurgitation degree of superheat SHd and upper limit of the 1st allowed value are compared, and when the regurgitation degree of superheat SHd is below the upper limit of the 1st allowed value, the closed state of the 2nd two way valve 17 is maintained. Moreover, although said regurgitation degree of superheat SHd increases when operational status changes with change of an OAT, an air-conditioning load, etc. and a circulation refrigerant is insufficient, with the lack of a refrigerant, when the regurgitation degree of superheat SHd exceeds the upper limit of the 1st allowed value, the 2nd two way valve 17 is changed into an open condition, and the surplus refrigerant currently stored by the receiver 11 is supplied to an accumulator 6. And when the regurgitation degree of superheat SHd becomes below the upper limit of the 1st allowed value by this supply, the 2nd two way valve 17 is made into a closed state.

[0032] As mentioned above, according to the operation gestalt 3, when a compressor 1 is started, the 1st two way valve 13 is changed into an open condition. Subtract the detection temperature Tc of the 2nd temperature sensor 22 from the detection temperature Td of the 1st temperature sensor 21, and it asks for the regurgitation degree of superheat SHd. And the lower limit of the 1st allowed value of the degree of superheat SHd and the regurgitation degree of superheat set up beforehand is compared. When the regurgitation degree of superheat SHd is below the lower limit of the 1st allowed value, hold the open condition of the 1st two way valve 13, and the reservoir of the surplus refrigerant to a receiver 11 is continued. Since the closed state of the 1st two way valve 13 is carried out and it was made to stop the reservoir when the regurgitation degree of superheat SHd exceeded the lower limit of the 1st allowed value It is effective in the ability to suppress small presentation change of the refrigerant which can store in a receiver 11 certainly, without accumulating a surplus refrigerant in an accumulator 6 even if service conditions, such as an OAT and piping extension, change, therefore circulates through a refrigerating cycle.

[0033] Moreover, at the time of steady operation, when said regurgitation degree of superheat SHd exceeds the upper limit of the 1st allowed value, change the 2nd two way valve 17 into an open condition, and the surplus refrigerant in rhe SHIBA 11 is supplied to an accumulator 6. Since the 2nd two way valve 17 is made into a closed state and it was made to stop the supply when the regurgitation degree of superheat SHd became below the upper limit of the 1st allowed value, even if it becomes insufficient [a refrigerant] during operation, it is effective in it being cancelable.

[0034] In addition, although the 1st and 2nd temperature sensors 21 and 22 were attached in the predetermined location and control of a surplus refrigerant was explained to the refrigerating cycle of the operation gestalt 1, it prepares in the refrigerating cycle which shows these 1st and 2nd temperature sensors 21 and 22 to the 2nd operation gestalt, and you may make it control a surplus refrigerant by the operation gestalt 3.

[0035] Operation gestalt 4. drawing 6 is the block diagram concerning the operation gestalt 4 of this invention showing the refrigerating cycle of an air conditioner, for example, and shows the condition at the time of air conditioning operation. In addition, the sign same identically to the operation gestalt 3 explained by drawing 4 as a considerable part is attached, and explanation is omitted.

[0036] It is attached in the inlet side of a compressor 1, the center section of the 3rd temperature sensor 23 which detects the temperature Ts of the gas refrigerant of low-temperature low voltage inhaled by the compressor 1, and the indoor heat exchanger 5 which operates as an evaporator is equipped, and the refrigerating cycle of this operation gestalt is

equipped with the 4th temperature sensor 24 which detects the temperature Te of the refrigerant evaporated by indoor heat exchanger 5.
[0037] Moreover, in case a control circuit 31 is equipped with the 2nd valve-control means of this invention, for example, the amount of the surplus refrigerant at the time of air conditioning operation is adjusted Subtract the detection temperature Te of the 4th temperature sensor 22 from the detection temperature Ts of the 3rd temperature sensor 21, and it asks for the inhalation degree of superheat SHs. And the lower limit of the 2nd allowed value of the degree of superheat SHs and the inhalation degree of superheat set up beforehand is compared. When the inhalation degree of superheat SHs is below the lower limit of the 2nd allowed value, the 1st two way valve 13 is changed into an open condition through the valve drive circuit 32, and when the inhalation degree of superheat SHs exceeds the lower limit of the 2nd allowed value, the 1st two way valve 13 is made into a closed state.
[0038] At the time of steady operation, when said inhalation degree of superheat SHs exceeds the upper limit of the 2nd allowed value, the 2nd two way valve 17 is changed into an open condition through the valve drive circuit 32, and when the inhalation degree of superheat SHs is below the upper limit of the 2nd allowed value, the 2nd two way valve 17 is made into a closed state. In addition, the 2nd allowed value of this operation gestalt is set as the operation gestalt 3 lower than the 1st allowed value of a publication.
[0039] Next, actuation of the refrigerating cycle constituted as mentioned above is explained based on drawing 7 . Drawing 7 is a flow chart concerning the operation gestalt 4 which shows actuation of the refrigerating cycle of an air conditioner, for example. In addition, since it is the same as the operation gestalt 1 about actuation of each part when circulating the above-mentioned non-azeotropy mixing refrigerant, explanation is omitted.
[0040] If a compressor 1 is started, a control circuit 31 will change the 1st two way valve 13 into an open condition through the valve drive circuit 32, as mentioned above, and will begin operation which stores a surplus refrigerant in a receiver 11. First, the temperature Te of the two phase refrigerant in indoor heat exchanger 5 is inputted through the 4th temperature sensor 24, and, subsequently to a compressor 1, the temperature Ts of the gas refrigerant of low-temperature low voltage inhaled is inputted through the 3rd temperature sensor 23. And the detection temperature Te of the 4th temperature sensor 24 is subtracted from the detection temperature Ts, and it asks for the inhalation degree of superheat SHs, and the lower limit of the degree of superheat SHs and the 2nd allowed value of the inhalation degree of superheat set up beforehand is compared.
[0041] Since the lower limit of the 2nd allowed value is higher than the inhalation degree of superheat SHs, the open condition of the 1st two way valve 13 is held at the time of a start up, and it starts the input of the detection temperature Ts of the 3rd temperature sensor 23, and the detection temperature Te of the 4th temperature sensor 24 again. If the refrigerant in an accumulator 6 is lost, the intake air temperature of a compressor 1 rises and the inhalation degree of superheat SHs based on the detection temperature Te and the detection temperature Ts exceeds the lower limit of the 2nd allowed value while repeating this actuation and performing it, the 1st two way valve 13 will be made into a closed state through the valve drive circuit 32, and the reservoir of the surplus refrigerant to a receiver 11 will be ended.
[0042] During steady operation, said inhalation degree of superheat SHs and upper limit of the 2nd allowed value are compared, and when the inhalation degree of superheat SHs is below the upper limit of the 2nd allowed value, the closed state of the 2nd two way valve 17 is maintained. Moreover, although said inhalation degree of superheat SHs increases when operational status changes with change of an OAT, an air-conditioning load, etc. and a circulation refrigerant is insufficient, with the lack of a refrigerant, when the inhalation degree of superheat SHs exceeds the upper limit of the 2nd allowed value, the 2nd two way valve 17 is changed into an open condition, and the surplus refrigerant currently stored by the receiver 11 is supplied to an accumulator 6. And when the inhalation degree of superheat SHs becomes below the upper limit of the 2nd allowed value by this supply, the 2nd two way valve 17 is made into a closed state.
[0043] As mentioned above, according to the operation gestalt 4, when a compressor 1 is started, the 1st two way valve 13 is changed into an open condition. Subtract the detection

temperature Te of the 4th temperature sensor 24 from the detection temperature Ts of the 3rd temperature sensor 23, and it asks for the inhalation degree of superheat SHs. And the lower limit of the 2nd allowed value of the degree of superheat SHs and the inhalation degree of superheat set up beforehand is compared. When the inhalation degree of superheat SHs is below the lower limit of the 2nd allowed value, change the 1st two way valve 13 into an open condition, and the reservoir of the surplus refrigerant to a receiver 11 is continued. Since the closed state of the 1st two way valve 13 is carried out and it was made to stop the reservoir when the inhalation degree of superheat SHs exceeded the lower limit of the 2nd allowed value It is effective in the ability to suppress small presentation change of the refrigerant which can store in a receiver 11 certainly, without accumulating a surplus refrigerant in an accumulator 6 even if service conditions, such as an OAT and piping extension, change, therefore circulates through a refrigerating cycle.

[0044] Moreover, at the time of steady operation, when said inhalation degree of superheat SHs exceeds the upper limit of the 2nd allowed value, change the 2nd two way valve 17 into an open condition, and the surplus refrigerant in a receiver 11 is supplied to an accumulator 6. Since the 2nd two way valve 17 is made into a closed state and it was made to stop the supply when the inhalation degree of superheat SHs became below the upper limit of the 2nd allowed value, even if it becomes insufficient [a refrigerant] during operation, it is effective in it being cancelable.

[0045] In addition, although the 3rd and 4th temperature sensors 23 and 24 were attached in the predetermined location and control of a surplus refrigerant was explained to the refrigerating cycle of the operation gestalt 1 as mentioned above, it prepares in the refrigerating cycle which shows these 3rd and 4th temperature sensors 23 and 24 to the 2nd operation gestalt, and you may make it control a surplus refrigerant by the operation gestalt 4.

[0046]

[Effect of the Invention] Since it is made to go via the 1st bypass way, it cools and some gas refrigerants of elevated-temperature high pressure breathed out from the compressor 1 were stored in the receiver according to this invention as mentioned above, it can become possible to lose the surplus refrigerant in an accumulator, presentation change of the refrigerant which circulates through a refrigerating cycle can also be suppressed small, and fluctuation of working pressure or capacity etc. can be prevented. Moreover, since the refrigerant inhaled by the compressor by losing the surplus refrigerant in an accumulator is certainly gasifiable, the effectiveness of a compressor becomes good and it is effective in COP of a refrigerating cycle improving.

[0047] moreover -- since the pars basilaris ossis occipitalis of an accumulator was caudad extended as a dashboard and the receiver was formed, in addition to said effectiveness, there is no heat exchanger -- ** -- it is effective in the ability to cool the gas refrigerant of elevated-temperature high pressure which goes via the 1st bypass way.

[0048] Furthermore, form the 1st temperature sensor in the discharge side of a compressor, and the 2nd temperature sensor is formed in a condenser, respectively. The difference of the detection temperature of the 1st temperature sensor and the detection temperature of the 2nd temperature sensor is calculated. And since the value was compared with the 1st allowed value set up beforehand, and it was made to change the 1st two way valve into the open condition when said value was below a lower limit of the 1st allowed value It is effective in the ability to suppress small presentation change of the refrigerant which can store in a receiver certainly, without accumulating a surplus refrigerant in an accumulator even if service conditions, such as an OAT and piping extension, change, therefore circulates through a refrigerating cycle. Moreover, since the 2nd two way valve is changed into an open condition and the surplus refrigerant in rhe SHIBA was supplied to the accumulator when said value exceeded the upper limit of the 1st allowed value, even if it becomes insufficient [a refrigerant] during operation, it is effective in it being cancelable.

[0049] Form the 3rd temperature sensor in the inlet side of a compressor, and the 4th temperature sensor is formed in an evaporator further again, respectively. The difference of the detection temperature of the 3rd temperature sensor and the detection temperature of the 4th temperature sensor is calculated. And since the value was compared with the 2nd allowed value

set up beforehand, and it was made to change the 1st two way valve into the open condition when said value was below a lower limit of the 1st allowed value It is effective in the ability to suppress small presentation change of the refrigerant which can store in a receiver certainly, without accumulating a surplus refrigerant in an accumulator even if service conditions, such as an OAT and piping extension, change, therefore circulates through a refrigerating cycle. Moreover, since the 2nd two way valve is changed into an open condition and the surplus refrigerant in rhe SHIBA was supplied to the accumulator when said value exceeded the upper limit of the 2nd allowed value, even if it becomes insufficient [a refrigerant] during operation, it is effective in it being cancelable.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the block diagram concerning the operation gestalt 1 of this invention showing the refrigerating cycle of an air conditioner, for example.
[Drawing 2] It is the comparison Fig. of presentation change of the circulation refrigerant when storing a non-azeotropy mixing refrigerant in a receiver and an accumulator.
[Drawing 3] It is the block diagram concerning the operation gestalt 2 of this invention showing the refrigerating cycle of an air conditioner, for example.
[Drawing 4] It is the block diagram concerning the operation gestalt 3 of this invention showing the refrigerating cycle of an air conditioner, for example.
[Drawing 5] It is the flow chart concerning the operation gestalt 3 which shows actuation of the refrigerating cycle of an air conditioner, for example.
[Drawing 6] It is with the block diagram concerning the operation gestalt 4 of this invention showing the refrigerating cycle of an air conditioner, for example.
[Drawing 7] It is the flow chart concerning the operation gestalt 4 which shows actuation of the refrigerating cycle of an air conditioner, for example.
[Drawing 8] It is the block diagram showing the refrigerating cycle of the conventional air conditioner.
[Description of Notations]
1 Compressor 2 Four Way Valve 3 Outdoor Heat Exchanger 4 Collimator, 5 Indoor heat exchanger 6 Accumulator 11 Receiver, 12 1st bypass way 13 The 1st two way valve 14 Capillary tube, 15 A quantity low voltage heat exchanger, 16 2nd bypass way 17 The 2nd two way valve, 21 The 1st thermo sensor 22 The 2nd temperature sensor 23 The 3rd thermo sensor 24 The 4th temperature sensor 31 A control circuit, 32 Valve drive circuit.

[Translation done.]

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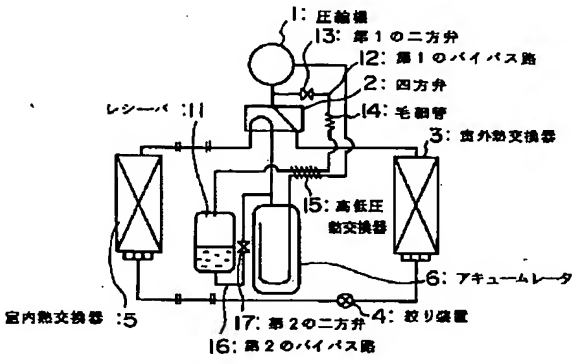
最終頁に続く

(54)【発明の名称】　冷凍サイクル

(57)【要約】

【課題】　非共沸混合冷媒を用いても、余剰冷媒による循環冷媒の組成の変動を抑制でき、かつ、ＣＯＰを向上させる冷凍サイクルを提供する。

【解決手段】　第１の二方弁１３及び冷媒流量を調整する毛細管１４が設けられ、圧縮機１と四方弁２をつなぐ配管とレシーバ１１とを接続する第１のバイパス路１２と、圧縮機１に吸入されるアキュームレータ６からの低圧の非共沸混合冷媒と第１のバイパス路１２内を通る高温高圧の前記冷媒とを熱交換をする高低圧熱交換器１５と、第２の二方弁１７が設けられ、レシーバ１１とアキュームレータ６とを接続する第２のバイパス路１６とを備えた。



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【特許請求の範囲】

【請求項１】　沸点の異なる２種類以上の冷媒からなる非共沸混合冷媒を高温高圧化し、四方弁、凝縮器、絞り装置、蒸発器及びアキュームレータを順に介して循環させる圧縮機と、

レシーバと、

第１の二方弁及び冷媒流量を調整する毛細管が設けられ、前記圧縮機と四方弁をつなぐ配管と前記レシーバとを接続する第１のバイパス路と、

前記圧縮機に吸入されるアキュームレータからの低圧の前記冷媒と前記第１のバイパス路内を通る高温高圧の前記冷媒とを熱交換をする熱交換器と、

第２の二方弁が設けられ、前記レシーバとアキュームレータとを接続する第２のバイパス路とを有することを特徴とする冷凍サイクル。

【請求項２】　前記レシーバは、前記アキュームレータの底部を仕切板として下方に延びて形成されていることを特徴とする請求項１記載の冷凍サイクル。

【請求項３】　前記圧縮機の吐出側に設置された第１の温度センサと、

前記凝縮器に設置された第２の温度センサと、

前記第１の温度センサの検知温度と前記第２の温度センサの検知温度との差を演算し、かつ、その値と予め設定された第１の許容値とを比較し、前記値が第１の許容値の下限値以下のときは前記第１の二方弁を開状態にし、前記値が第１の許容値の上限値を越えたときは前記第２の二方弁を開状態にする第１の弁制御手段とを備えていることを特徴とする請求項１又は２のいずれかに記載の冷凍サイクル。

【請求項４】　前記圧縮機の吸入側に設置された第３の温度センサと、

前記蒸発器に設置された第４の温度センサと、

前記第３の温度センサの検知温度と前記第４の温度センサの検知温度との差を演算し、かつ、その値と予め設定された第２の許容値とを比較し、前記値が第２の許容値の下限値以下のときは前記第１の二方弁を開状態にし、前記値が第２の許容値の上限値を越えたときは前記第２の二方弁を開状態にする第２の弁制御手段とを備えていることを特徴とする請求項１又は２のいずれかに記載の冷凍サイクル。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は、沸点の異なる２種類以上の冷媒からなる非共沸混合冷媒を封入した空気調和機等の冷凍サイクルに関するものである。

【０００２】

【従来の技術】図８は従来の空気調和機の冷凍サイクルを示すブロック図であり、図において、１はアキュームレータ６内の低温低圧のガス冷媒を吸入して圧縮し高温高圧のガス冷媒にする圧縮機、２は四方弁、３は凝縮器

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として動作する室外熱交換器、４は絞り装置、５は蒸発器として動作する室内熱交換器である。

【０００３】前記のように構成された従来の空気調和機の冷凍サイクルにおいては、例えば冷房運転の場合、圧縮機１より高温高圧のガス冷媒が吐出し、四方弁２を通って室外熱交換器３に入る。このガス冷媒は室外熱交換器により外気と熱交換されて液状の冷媒となり絞り装置４に入る。液化された冷媒は、絞り装置４によって減圧され、乾き度の低い二相冷媒となって室内熱交換器５に送り込まれる。そして、室内熱交換器５で室内の空気と熱交換されて蒸発し、乾き度の高い二相冷媒となって四方弁２、アキュームレータ６を経由し、再び圧縮機１に吸入される。この時、アキュームレータ６には冷媒回路内で余った余剰冷媒が貯留される。

【０００４】

【発明が解決しようとする課題】前記のような従来の冷凍サイクルにおいて、例えばＲ（フロン）１３４ａを５２重量%、Ｒ１２５を２５重量%、Ｒ３２を２３重量%の比率で混合した非共沸混合冷媒を用いた場合、アキュームレータ６に貯留される余剰冷媒の中で低沸点冷媒であるＲ３２、Ｒ１２５が多くガス化し易いため、冷凍サイクル中を循環する冷媒は低沸点冷媒であるＲ３２、Ｒ１２５が多めの組成となり、アキュームレータ６に貯留される余剰冷媒の量が変化した場合には、冷凍サイクル中を循環する冷媒の組成も変化してしまい、このことから循環冷媒の物性が変動したり、動作圧力や能力の変動等が生じていた。

【０００５】また、混合冷媒の非共沸性により、従来から用いられてきたＲ２２等の単一冷媒と比べ熱交換器配管内の熱伝達率が小さくなることが知られており、これにより冷凍サイクルのＣＯＰ（効率）が低下するという課題もあった。

【０００６】本発明は、かかる課題を解決するためになされたもので、非共沸混合冷媒を用いても、余剰冷媒による循環冷媒の組成の変動を抑制でき、かつ、ＣＯＰを向上させる冷凍サイクルを提供することを目的とする。

【０００７】

【課題を解決するための手段】本発明に係る冷凍サイクルは、沸点の異なる２種類以上の冷媒からなる非共沸混合冷媒を高温高圧化し、四方弁、凝縮器、絞り装置、蒸発器及びアキュームレータを順に介して循環させる圧縮機と、レシーバと、第１の二方弁及び冷媒流量を調整する毛細管が設けられ、前記圧縮機と四方弁をつなぐ配管と前記レシーバとを接続する第１のバイパス路と、前記圧縮機に吸入されるアキュームレータからの低圧の前記冷媒と前記第１のバイパス路内を通る高温高圧の前記冷媒とを熱交換をする熱交換器と、第２の二方弁が設けられ、前記レシーバとアキュームレータとを接続する第２のバイパス路とを有したものである。

【０００８】前記レシーバは、前記アキュームレータの

底部を仕切板として下方に延びて形成されたものである。

【０００９】また、前記圧縮機の吐出側に設置された第１の温度センサと、前記凝縮器に設置された第２の温度センサと、前記第１の温度センサの検知温度と前記第２の温度センサの検知温度との差を演算し、かつ、その値と予め設定された第１の許容値とを比較し、前記値が第１の許容値の下限値以下のときは前記第１の二方弁を開状態にし、前記値が第１の許容値の上限値を越えたときは前記第２の二方弁を開状態にする第１の弁制御手段とを備えたものである。

【００１０】さらに、前記圧縮機の吸入側に設置された第３の温度センサと、前記蒸発器に設置された第４の温度センサと、前記第３の温度センサの検知温度と前記第４の温度センサの検知温度との差を演算し、かつ、その値と予め設定された第２の許容値とを比較し、前記値が第２の許容値の下限値以下のときは前記第１の二方弁を開状態にし、前記値が第２の許容値の上限値を越えたときは前記第２の二方弁を開状態にする第２の弁制御手段とを備えたものである。

【００１１】

【発明の実施の形態】実施形態１．図１は本発明の実施形態１に係る例えば空気調和機の冷凍サイクルを示すブロック図で、冷房運転時の状態を示している。なお、図８で説明した従来と同一又は相当部分には同じ符号を付し説明を省略する。

【００１２】図において、１１はレシーバ、１２は圧縮機１と四方弁２とをつなぐ配管から分岐してレシーバ１１に接続された第１のバイパス路、１３は第１のバイパス路１２を開閉する第１の二方弁、１４は第１のバイパス路１２に流れる高温高圧のガス冷媒の量を調整する毛細管、１５は圧縮機１に吸入される低温低圧のガス冷媒と第１のバイパス路１２内を通る高温高圧のガス冷媒とを熱交換をする高低圧熱交換器、１６はアキュームレータ６の入口配管から分岐してレシーバ１１の底部に接続された第２のバイパス路、１７は第２のバイパス路１６を開閉する第２の二方弁である。なお、本実施形態に用いられている冷媒は、沸点の異なる２種類以上の冷媒からなる非共沸混合冷媒である。

【００１３】前記のように構成された冷凍サイクルにおいて冷房運転時の動作を説明する。なお、運転開始時、第１の二方弁が開状態になっているものとする。圧縮機１より高温高圧のガス冷媒が吐出し、四方弁２を通って室外熱交換器３に入る。このガス冷媒は室外熱交換器３により外気と熱交換されて液状の冷媒となり絞り装置４に入る。液化された冷媒は絞り装置４によって減圧され、乾き度０．２～０．３の低温低圧の二相冷媒となって室内熱交換器５に送り込まれる。そして、室内熱交換器５で室内の空気と熱交換されて蒸発し、乾き度０．９～１．０の低温低圧の二相冷媒となって四方弁２、アキュームレータ６を経由し、再び圧縮機１に吸入される。

【００１４】一方、圧縮機１から吐出された高温高圧のガス冷媒の一部は、第１の二方弁１３の開により第１のバイパス路１２の方へ流れて毛細管１４を通り、さらに、高低圧熱交換器１５を通りながら圧縮機１に吸入される低温低圧のガス冷媒と熱交換され、即ち、冷却されて高圧の液体冷媒となりレシーバ１１に余剰冷媒として貯留される。

【００１５】ここで、図２に基づいて余剰冷媒の組成変化について説明する。図２は非共沸混合冷媒をレシーバとアキュームレータに貯留したときの循環冷媒の組成変化の比較図である。図８に示す従来のような冷凍サイクルのアキュームレータ６に余剰の非共沸混合冷媒を溜めるようにした場合は、その混合冷媒が低圧であるため組成変化が大きくなってしまい（イ参照）。これに対して、本実施形態の場合は、レシーバ１１内に高温の余剰混合冷媒（液状）を貯留しているので、冷凍サイクルを循環するその混合冷媒の組成変化が小さくなる（ロ参照）。

【００１６】なお、定常運転中に外気温度や空調負荷等の変化により運転状態が変化して冷媒不足となった場合には、第２の二方弁１７を開状態にし、レシーバ１１内に貯溜された余剰冷媒をアキュームレータ６に補給する。

【００１７】以上のように実施形態１によれば、圧縮機１から吐出された高温高圧のガス冷媒の一部、即ち余剰冷媒を第１のバイパス路１２を経由させて冷却しレシーバ１１に貯留するようにしたので、アキュームレータ６内の余剰冷媒をなくすことが可能になり、冷凍サイクルを循環する冷媒の組成変化も小さく抑えることができ、動作圧力や能力の変動などを防止することができる。

【００１８】また、アキュームレータ６内の余剰冷媒をなくすことにより圧縮機１に吸入される冷媒を確実にガス化することができるので、圧縮機１の効率がよくなり、かつ、冷凍サイクルのＣＯＰが向上するという効果がある。

【００１９】実施形態２．図３は本発明の実施形態２に係る例えば空気調和機の冷凍サイクルを示すブロック図で、冷房運転時の状態を示している。なお、図１で説明した実施形態１と同一又は相当部分には同じ符号を付し説明を省略する。

【００２０】実施形態２においては、レシーバ１１がアキュームレータ６の底部を仕切板１８として下方に延びて形成され、この仕切板１８は、レシーバ１１に導かれた高温高圧のガス冷媒をアキュームレータ６内の低温低圧のガス冷媒と熱交換するためのものである。アキュームレータ６とレシーバ１１は第２のバイパス路１６によって接続され、レシーバ１１は、圧縮機１と四方弁２を結ぶ配管に第１のバイパス路１２を介して接続されている。この第１のバイパス路１２には第１の二方弁１３と

毛細管１４が設けられ、第２にバイパス路１６には第２の二方弁１７が取り付けられている。

【００２１】次に冷房運転時の動作を説明する。なお、実施形態２における冷媒の循環については実施形態１と同様であるため動作の説明を省略する。第１の二方弁１３の開により圧縮機１から吐出された高温高圧のガス冷媒の一部が第１のバイパス路１２に導かれると、毛細管１４を通ってレシーバ１１に入る。この時、レシーバ１１内に入った高温高圧のガス冷媒は、仕切板１８によりアキュームレータ６内の低温低圧のガス冷媒と熱交換されて高圧の液体冷媒となり、余剰冷媒として貯留される。

【００２２】なお、本実施形態においても冷凍サイクルが冷媒不足となった場合には、第２の二方弁１７を開状態にし、レシーバ１１内に貯溜された余剰冷媒をアキュームレータ６に補充する。

【００２３】このように、レシーバ１１を、アキュームレータ６の底部を仕切板１８として下方に延ばして形成したので、高低圧熱交換器１５が無くとも第１のバイパス路１２を経由する高温高圧のガス冷媒を冷却できるという効果がある。

【００２４】実施形態３．図４は本発明の実施形態３に係る例えば空気調和機の冷凍サイクルを示すブロック図で、冷房運転時の状態を示している。なお、図１で説明した実施形態１と同一又は相当部分には同じ符号を付し説明を省略する。

【００２５】図において、２１は圧縮機１と四方弁２とを結ぶ配管に取り付けられ、圧縮機１より吐出された高温高圧のガス冷媒の温度Ｔｄを検知する第１の温度センサ、２２は凝縮器として動作する室外熱交換器３の中央部に装着され、室外熱交換器３により冷却される冷媒の温度Ｔｃを検知する第２の温度センサである。

【００２６】３１は例えば空気調和機の圧縮機１等を制御する制御回路で、本発明の第１の弁制御手段を備え、例えば冷房運転時の余剰冷媒の量を調整する際は、第１の温度センサ２１の検知温度Ｔｄから第２の温度センサ２２の検知温度Ｔｃを減算して吐出過熱度ＳＨｄを求め、かつ、その過熱度ＳＨｄと予め設定された吐出過熱度の第１の許容値の下限値とを比較し、吐出過熱度ＳＨｄが第１の許容値の下限値以下のときは弁駆動回路３２を通じて第１の二方弁１３を開状態にし、吐出過熱度ＳＨｄが第１の許容値の下限値を越えたときは第１の二方弁１３を閉状態にする。

【００２７】また、定常運転時は、前記吐出過熱度ＳＨｄと第１の許容値の上限値とを比較し、その吐出過熱度ＳＨｄが第１の許容値の上限値を越えたとき弁駆動回路３２を通じて第２の二方弁１７を開状態にし、吐出過熱度ＳＨｄが第１の許容値の上限値以下のときは第２の二方弁１７を閉状態にする。なお、前述した第１及び第２の二方弁１３，１７は、例えば電磁弁からなっている。

【００２８】次に、前記のように構成された冷凍サイクルの動作を図５に基づいて説明する。図５は実施形態３に係る例えば空気調和機の冷凍サイクルの動作を示すフローチャートである。なお、前述の非共沸混合冷媒を循環させるときの各部の動作については実施形態１と同じであるため説明を省略する。

【００２９】制御回路３１は、圧縮機１を起動すると、弁駆動回路３２を通じて第１の二方弁１３を開状態にし、レシーバ１１内に余剰冷媒を貯留する運転を始める。まず、第２の温度センサ２２を通して室外熱交換器３内の二相冷媒の温度Ｔｃを入力し、次いで、圧縮機１より吐出された高温高圧のガス冷媒の温度Ｔｄを第１の温度センサ２１を介して入力する。そして、その検知温度Ｔｄから第２の温度センサ２２の検知温度Ｔｃを減算して吐出過熱度ＳＨｄを求め、かつ、その過熱度ＳＨｄと予め設定された吐出過熱度の第１の許容値の下限値とを比較する。

【００３０】運転開始時は吐出過熱度ＳＨｄより第１の許容値の下限値の方が高いので、第１の二方弁１３の開状態を保持し、再び、第２の温度センサ２２の検知温度Ｔｃと第１の温度センサ２１の検知温度Ｔｄの入力に入る。この動作を繰り返し行っていくうちにアキュームレータ６内の冷媒が無くなり、圧縮機１の吸入温度が上昇して検知温度Ｔｃと検知温度Ｔｄとに基づく吐出過熱度ＳＨｄが第１の許容値の下限値を越えると、弁駆動回路３２を通じて第１の二方弁１３を閉状態にし、レシーバ１１への余剰冷媒の貯留を終了する。

【００３１】定常運転中は前記吐出過熱度ＳＨｄと第１の許容値の上限値とを比較し、その吐出過熱度ＳＨｄが第１の許容値の上限値以下のときは第２の二方弁１７の閉状態を維持する。また、外気温度や空調負荷等の変化により運転状態が変化して循環冷媒が不足状態となった場合は前記吐出過熱度ＳＨｄが増加するが、その冷媒不足により、吐出過熱度ＳＨｄが第１の許容値の上限値を越えたときは第２の二方弁１７を開状態にし、レシーバ１１に貯留されている余剰冷媒をアキュームレータ６に補給する。そして、この補給により吐出過熱度ＳＨｄが第１の許容値の上限値以下になったときに第２の二方弁１７を閉状態にする。

【００３２】以上のように実施形態３によれば、圧縮機１を起動したとき第１の二方弁１３を開状態にし、そして、第１の温度センサ２１の検知温度Ｔｄから第２の温度センサ２２の検知温度Ｔｃを減算して吐出過熱度ＳＨｄを求め、かつ、その過熱度ＳＨｄと予め設定された吐出過熱度の第１の許容値の下限値とを比較し、吐出過熱度ＳＨｄが第１の許容値の下限値以下のときは第１の二方弁１３の開状態を保持してレシーバ１１への余剰冷媒の貯留を継続し、吐出過熱度ＳＨｄが第１の許容値の下限値を越えたときは第１の二方弁１３を閉状態してその貯留を停止するようにしたので、外気温度や配管延長等

の運転条件が変化しても余剰冷媒をアキュームレータ６に溜めることなく確実にレシーバ１１内に貯留することができ、そのため、冷凍サイクルを循環する冷媒の組成変化を小さく抑えることができるという効果がある。

【００３３】また、定常運転時は、前記吐出過熱度ＳＨｄが第１の許容値の上限値を越えたとき第２の二方弁１７を開状態にしてレーシーバ１１内の余剰冷媒をアキュームレータ６に補給し、吐出過熱度ＳＨｄが第１の許容値の上限値以下になったときに第２の二方弁１７を閉状態にしてその補給を停止するようにしたので、運転中に冷媒不足となってもそれを解消できるという効果もある。

【００３４】なお、実施形態３では、実施形態１の冷凍サイクルに第１及び第２の温度センサ２１，２２を所定位置に取り付けて余剰冷媒の制御について説明したが、この第１及び第２の温度センサ２１，２２を第２の実施形態に示す冷凍サイクルに設けて余剰冷媒を制御するようにしてもよい。

【００３５】実施形態４．図６は本発明の実施形態４に係る例えば空気調和機の冷凍サイクルを示すブロック図で、冷房運転時の状態を示している。なお、図４で説明した実施形態３と同一又は相当部分には同じ符号を付し説明を省略する。

【００３６】本実施形態の冷凍サイクルには、圧縮機１の吸入側に取り付けられ、圧縮機１により吸入される低温低圧のガス冷媒の温度Ｔｓを検知する第３の温度センサ２３と、蒸発器として動作する室内熱交換器５の中央部に装着され、室内熱交換器５により気化される冷媒の温度Ｔｅを検知する第４の温度センサ２４とが備えられている。

【００３７】また、制御回路３１は、本発明の第２の弁制御手段を備え、例えば冷房運転時の余剰冷媒の量を調整する際は、第３の温度センサ２１の検知温度Ｔｓから第４の温度センサ２２の検知温度Ｔｅを減算して吸入過熱度ＳＨｓを求め、かつ、その過熱度ＳＨｓと予め設定された吸入過熱度の第２の許容値の下限値とを比較し、吸入過熱度ＳＨｓが第２の許容値の下限値以下のときは弁駆動回路３２を通じて第１の二方弁１３を開状態にし、吸入過熱度ＳＨｓが第２の許容値の下限値を越えたときは第１の二方弁１３を閉状態にする。

【００３８】定常運転時は、前記吸入過熱度ＳＨｓが第２の許容値の上限値を越えたとき弁駆動回路３２を通じて第２の二方弁１７を開状態にし、吸入過熱度ＳＨｓが第２の許容値の上限値以下のときは第２の二方弁１７を閉状態にする。なお、本実施形態の第２の許容値は、実施形態３に記載の第１の許容値より低く設定されている。

【００３９】次に、前記のように構成された冷凍サイクルの動作を図７に基づいて説明する。図７は実施形態４に係る例えば空気調和機の冷凍サイクルの動作を示すフローチャートである。なお、前述の非共沸混合冷媒を循環させるときの各部の動作については実施形態１と同じであるため説明を省略する。

【００４０】制御回路３１は、圧縮機１を起動すると、前述したように弁駆動回路３２を通じて第１の二方弁１３を開状態にし、レシーバ１１内に余剰冷媒を貯留する運転を始める。まず、第４の温度センサ２４を通して室内熱交換器５内の二相冷媒の温度Ｔｅを入力し、次いで、圧縮機１に吸入される低温低圧のガス冷媒の温度Ｔｓを第３の温度センサ２３を介して入力する。そして、その検知温度Ｔｓから第４の温度センサ２４の検知温度Ｔｅを減算して吸入過熱度ＳＨｓを求め、かつ、その過熱度ＳＨｓと予め設定された吸入過熱度の第２の許容値の下限値とを比較する。

【００４１】運転開始時は吸入過熱度ＳＨｓより第２の許容値の下限値の方が高いので、第１の二方弁１３の開状態を保持し、再び、第３の温度センサ２３の検知温度Ｔｓと第４の温度センサ２４の検知温度Ｔｅの入力に入る。この動作を繰り返し行っていくうちにアキュームレータ６内の冷媒が無くなり、圧縮機１の吸入温度が上昇して検知温度Ｔｅと検知温度Ｔｓとに基づく吸入過熱度ＳＨｓが第２の許容値の下限値を越えると、弁駆動回路３２を通じて第１の二方弁１３を閉状態にし、レシーバ１１への余剰冷媒の貯留を終了する。

【００４２】定常運転中は前記吸入過熱度ＳＨｓと第２の許容値の上限値とを比較し、その吸入過熱度ＳＨｓが第２の許容値の上限値以下のときは第２の二方弁１７の閉状態を維持する。また、外気温度や空調負荷等の変化により運転状態が変化して循環冷媒が不足状態となった場合は前記吸入過熱度ＳＨｓが増加するが、その冷媒不足により、吸入過熱度ＳＨｓが第２の許容値の上限値を越えたときは第２の二方弁１７を開状態にし、レシーバ１１に貯留されている余剰冷媒をアキュームレータ６に補給する。そして、この補給により吸入過熱度ＳＨｓが第２の許容値の上限値以下になったときに第２の二方弁１７を閉状態にする。

【００４３】以上のように実施形態４によれば、圧縮機１を起動したとき第１の二方弁１３を開状態にし、そして、第３の温度センサ２３の検知温度Ｔｓから第４の温度センサ２４の検知温度Ｔｅを減算して吸入過熱度ＳＨｓを求め、かつ、その過熱度ＳＨｓと予め設定された吸入過熱度の第２の許容値の下限値とを比較し、吸入過熱度ＳＨｓが第２の許容値の下限値以下のときは第１の二方弁１３を開状態にしてレシーバ１１への余剰冷媒の貯留を継続し、吸入過熱度ＳＨｓが第２の許容値の下限値を越えたときは第１の二方弁１３を閉状態にしてその貯留を停止するようにしたので、外気温度や配管延長等の運転条件が変化しても余剰冷媒をアキュームレータ６に溜めることなく確実にレシーバ１１内に貯留することができ、そのため、冷凍サイクルを循環する冷媒の組成変化

を小さく抑えることができるという効果がある。

【００４４】また、定常運転時は、前記吸入過熱度ＳＨｓが第２の許容値の上限値を越えたとき第２の二方弁１７を開状態にしてレシーバ１１内の余剰冷媒をアキュームレータ６に補給し、吸入過熱度ＳＨｓが第２の許容値の上限値以下になったときに第２の二方弁１７を閉状態にしてその補給を停止するようにしたので、運転中に冷媒不足となってもそれを解消できるという効果もある。

【００４５】なお、実施形態４では、前述したように実施形態１の冷凍サイクルに第３及び第４の温度センサ２３，２４を所定位置に取り付けて余剰冷媒の制御について説明したが、この第３及び第４の温度センサ２３，２４を第２の実施形態に示す冷凍サイクルに設けて余剰冷媒を制御するようにしてもよい。

【００４６】

【発明の効果】以上のように本発明によれば、圧縮機１から吐出された高温高圧のガス冷媒の一部を第１のバイパス路を経由させて冷却しレシーバに貯留するようにしたので、アキュームレータ内の余剰冷媒をなくすことが可能になり、冷凍サイクルを循環する冷媒の組成変化も小さく抑えることができ、動作圧力や能力の変動などを防止することができる。また、アキュームレータ内の余剰冷媒をなくすことにより圧縮機に吸入される冷媒を確実にガス化することができるので、圧縮機の効率がよくなり、かつ、冷凍サイクルのＣＯＰが向上するという効果がある。

【００４７】また、レシーバを、アキュームレータの底部を仕切板として下方に延ばして形成したので、前記効果に加え熱交換器が無くとも第１のバイパス路を経由する高温高圧のガス冷媒を冷却できるという効果がある。

【００４８】さらに、圧縮機の吐出側に第１の温度センサを、凝縮器に第２の温度センサをそれぞれ設けて、第１の温度センサの検知温度と第２の温度センサの検知温度との差を演算し、かつ、その値と予め設定された第１の許容値とを比較し、前記値が第１の許容値の下限値以下のときは第１の二方弁を開状態にするようにしたので、外気温度や配管延長等の運転条件が変化しても余剰冷媒をアキュームレータに溜めることなく確実にレシーバ内に貯留することができ、そのため、冷凍サイクルを循環する冷媒の組成変化を小さく抑えることができるという効果がある。また、前記値が第１の許容値の上限値を越えたときは第２の二方弁を開状態にしてレーシーバ内の余剰冷媒をアキュームレータに補給するようにしたので、運転中に冷媒不足となってもそれを解消できるという効果もある。

【００４９】さらにまた、圧縮機の吸入側に第３の温度センサを、蒸発器に第４の温度センサをそれぞれ設けて、第３の温度センサの検知温度と第４の温度センサの検知温度との差を演算し、かつ、その値と予め設定された第２の許容値とを比較し、前記値が第１の許容値の下限値以下のときは第１の二方弁を開状態にするようにしたので、外気温度や配管延長等の運転条件が変化しても余剰冷媒をアキュームレータに溜めることなく確実にレシーバ内に貯留することができ、そのため、冷凍サイクルを循環する冷媒の組成変化を小さく抑えることができるという効果がある。また、前記値が第２の許容値の上限値を越えたときは第２の二方弁を開状態にしてレーシーバ内の余剰冷媒をアキュームレータに補給するようにしたので、運転中に冷媒不足となってもそれを解消できるという効果もある。

【図面の簡単な説明】

【図１】　本発明の実施形態１に係る例えば空気調和機の冷凍サイクルを示すブロック図である。

【図２】　非共沸混合冷媒をレシーバとアキュームレータに貯留したときの循環冷媒の組成変化の比較図である。

【図３】　本発明の実施形態２に係る例えば空気調和機の冷凍サイクルを示すブロック図である。

【図４】　本発明の実施形態３に係る例えば空気調和機の冷凍サイクルを示すブロック図である。

【図５】　実施形態３に係る例えば空気調和機の冷凍サイクルの動作を示すフローチャートである。

【図６】　本発明の実施形態４に係る例えば空気調和機の冷凍サイクルを示すブロック図でである。

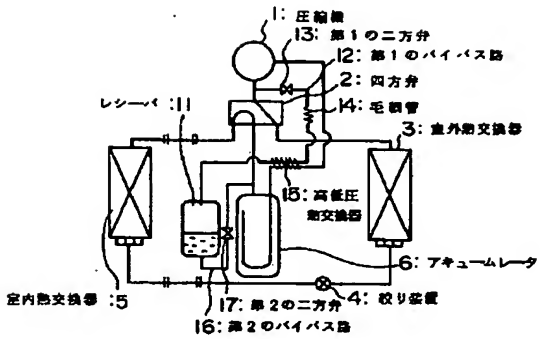
【図７】　実施形態４に係る例えば空気調和機の冷凍サイクルの動作を示すフローチャートである。

【図８】　従来の空気調和機の冷凍サイクルを示すブロック図である。

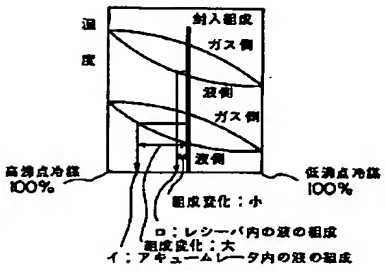
【符号の説明】

１　圧縮機、　２　四方弁、　３　室外熱交換器、　４　絞り装置、　５　室内熱交換器、　６　アキュームレータ、　１１　レシーバ、　１２　第１のバイパス路、　１３　第１の二方弁、　１４　毛細管、　１５　高低圧熱交換器、１６　第２のバイパス路、　１７　第２の二方弁、　２１　第１の温度センサー、　２２　第２の温度センサ、　２３　第３の温度センサー、　２４　第４の温度センサ、　３１　制御回路、３２　弁駆動回路。

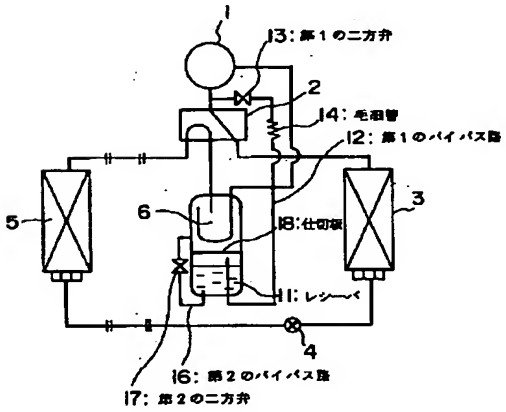
【図１】


1: 圧縮機
13: 第１の二方弁
12: 第１のバイパス路
2: 四方弁
14: 毛細管
レシーバ :11
3: 室外熱交換器
15: 高低圧熱交換器
6: アキュームレータ
4: 絞り装置
室内熱交換器 :5
17: 第２の二方弁
16: 第２のバイパス路

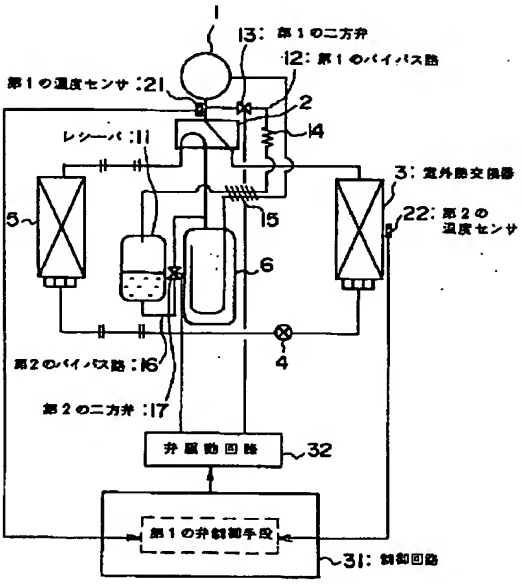
【図２】


温度
封入組成
ガス側
液側
ガス側
液側
高沸点冷媒 100%
低沸点冷媒 100%
組成変化：小
ロ：レシーバ内の液の組成
組成変化：大
イ：アキュームレータ内の液の組成

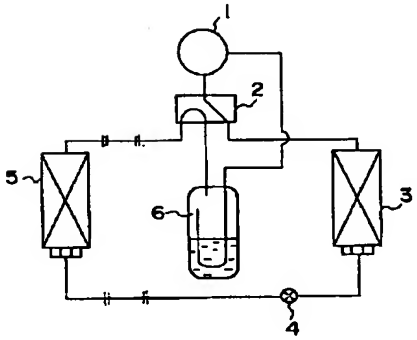
【図３】


1
13: 第１の二方弁
2
14: 毛細管
12: 第１のバイパス路
5
6
18: 仕切板
3
11: レシーバ
4
16: 第２のバイパス路
17: 第２の二方弁

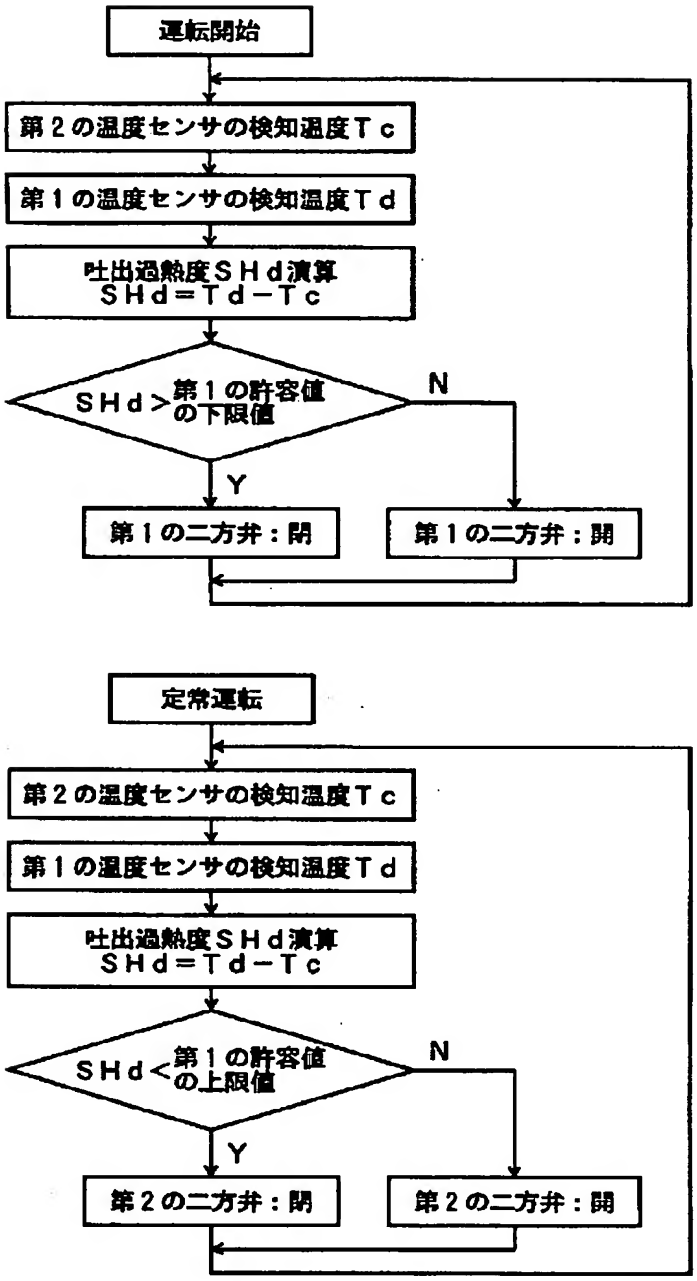
【図４】


1
13: 第１の二方弁
12: 第１のバイパス路
第１の温度センサ :21
2
14
レシーバ :11
3: 室外熱交換器
5
15
22: 第２の温度センサ
6
4
第２のバイパス路 :16
第２の二方弁 :17
弁駆動回路
32
第１の弁制御手段
31: 制御回路

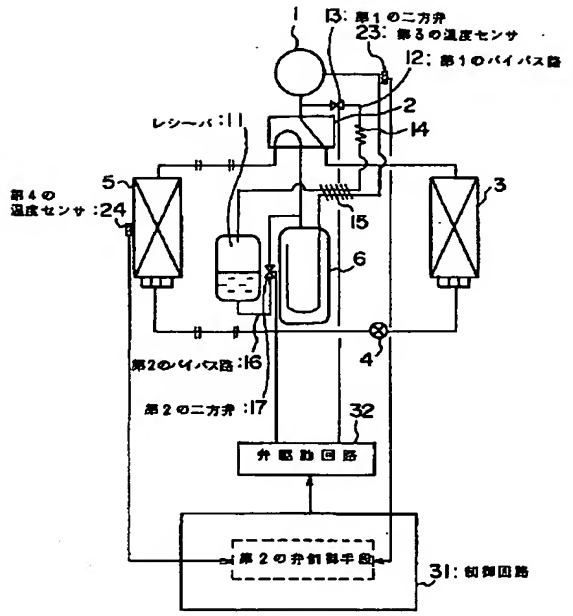
【図８】


1
2
5
6
3
4

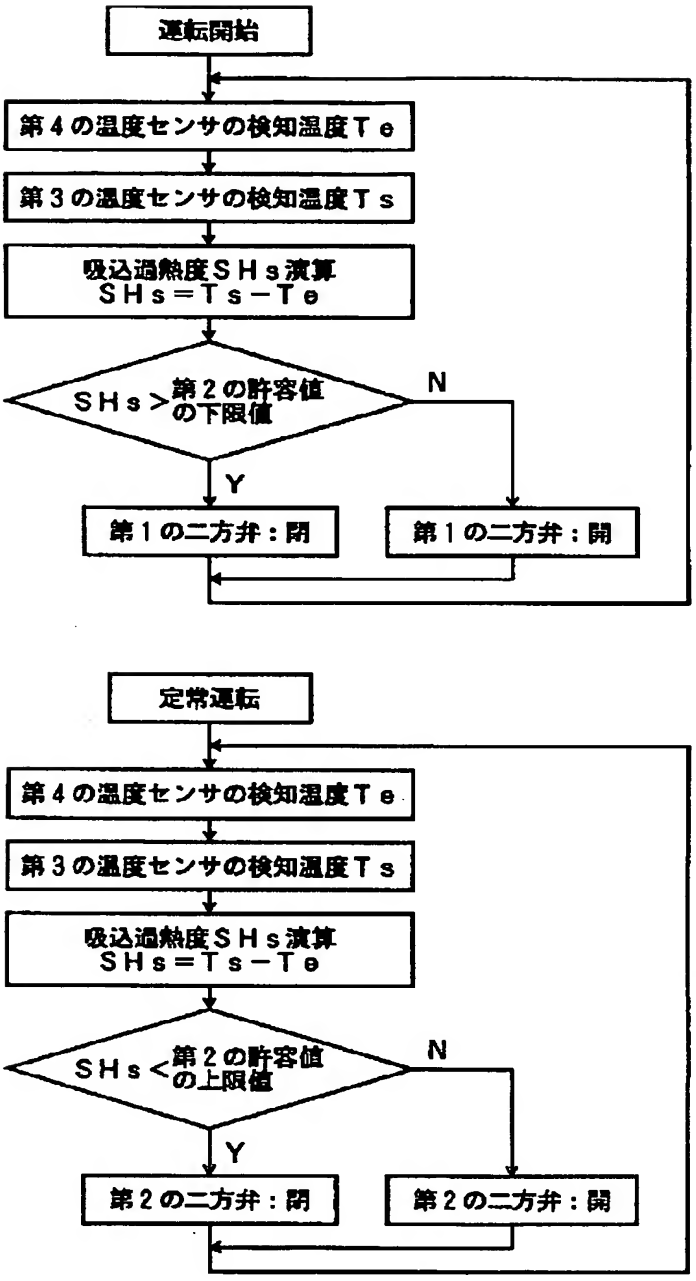
【図５】


運転開始
第２の温度センサの検知温度Ｔｃ
第１の温度センサの検知温度Ｔｄ
吐出過熱度ＳＨｄ演算
ＳＨｄ＝Ｔｄ－Ｔｃ
ＳＨｄ＞第１の許容値の下限値
N
Y
第１の二方弁：閉
第１の二方弁：開
定常運転
第２の温度センサの検知温度Ｔｃ
第１の温度センサの検知温度Ｔｄ
吐出過熱度ＳＨｄ演算
ＳＨｄ＝Ｔｄ－Ｔｃ
ＳＨｄ＜第１の許容値の上限値
N
Y
第２の二方弁：閉
第２の二方弁：開

【図６】


1
13: 第１の二方弁
23: 第３の温度センサ
12: 第１のバイパス路
2
14
レシーバ:11
5
第４の
温度センサ:24
3
15
6
4
第2のバイパス路:16
第２の二方弁:17
32
弁駆動回路
第２の弁制御手段
31: 制御回路

【図７】



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